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THE

NEW ZEALAND ENTOMOLOGIST

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Observations on *Hydrellia tritici Coq.* (DIPTERA: Ephydridae) as a Pest on Pasture in Auckland

By BRENDA M. MAY

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The ephydrid fly *Hydrellia tritici* Coq., very commonly swept from pastures, is here recorded as causing damage to pasture grasses in Auckland. The characters by which this species may be separated from the agromyzid fly *Cerodontha denticornis* (Panz.) are described.

In September, 1959, while pasture grasses from a paddock in Mangere were being examined, it was noticed that considerable damage was being caused by the leaf mining activities of dipterous larvae. It was found, on examination of larvae and pupae taken from the mines, that they were of two distinct types. These were separated and the pupae bred out. The resulting flies were identified by Dr. R. A. Harrison as *C. denticornis* and *H. tritici.*

Cumber and Harrison (1959), in their survey of pasture dwelling Diptera, indicated that *H. tritici*, due to the phytophagous habits of the larvae, and the large numbers of adults present, was a potential pest which would repay further study. The following observations, made by the author in the course of work on a different project, confirm this opinion.

The ephydrid larvae appeared to behave in a manner similar to those of *C. denticornis.* The mines usually began in the leaf blade, travelling down to the sheath, where they became broader, the larva sometimes hollowing out the entire sheath before pupating. Pupation usually occurred in the sheath, but sometimes in the leaf blade, if this was a long one. Pupae were also found on the ground.

During September and October the larvae and pupae of *H. tritici* were quite as numerous as those of *C. denticornis.* During the latter part of November and early December the proportion of ephydrids became less, and none were found in January or in the subsequent five months, in the paddock under observation. Pupae and adults were again noticed there in mid-July. Larvae and pupae

were taken from the following grasses: *Poa annua, P. trivialis* and *Lolium* sp. Adults are recorded as having been taken in all months except May and June, in varying situations and localities (Harrison, 1959; Cumber and Harrison, 1959).

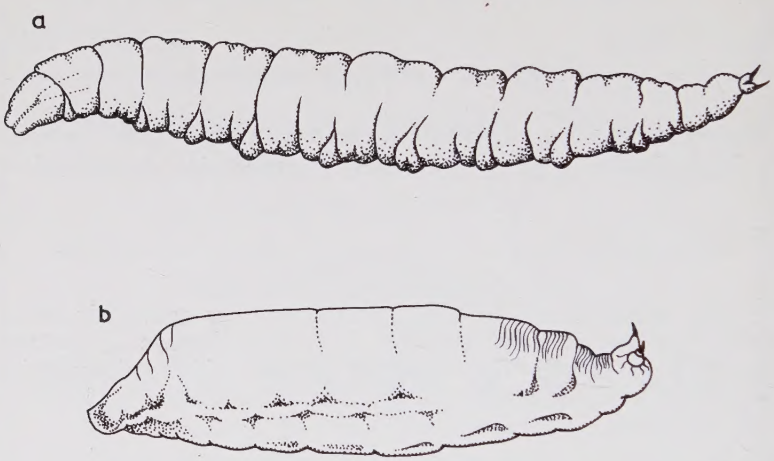

Fig. 1.—a, Larva of *Hydrellia tritici* Coq. × 25. b, Pupa of *Hydrellia tritici* Coq. × 25.

The larva of *Hydrellia tritici* (Fig. 1a) measures 4.0 x 1.0 mm. It is greenish-white in colour. The shape is cylindrical, tapering towards the head, where the mouthparts are visible, and towards the posterior, where the caudal segment is elongate, curved dorsally, and bears two sharply pointed, black tipped spiracular processes. By contrast, the caudal segment of *C. denticornis* is blunt and only slightly narrower than the preceding one. The spiracles show as two short, bristle-like projections near the dorsum.

The pupa of *H. tritici* (Fig. 1b) measures 3.0 x 1.2 mm. It is pale brown and almost transparent. The apex is flattened obliquely on the dorsal surface while the caudal segment bearing the two spiracular horns is more strongly curved than in the larva. These protrude through the leaf cuticle when the pupa is in position. The pupa of *C. denticornis* is more barrel-shaped with well defined segmentation. The spiracles are relatively inconspicuous and the terminal segment, though narrowed, is not curved.

The adult of *H. tritici* is a shining black species, dusted with greyish-brown. The head is velvety black and brown, the wings are iridescent, halteres bright yellow and legs mainly testaceous. Body length is about 2.0 mm and wing length about 2.0 mm. *C. denticornis* is a slightly smaller fly (1.75 mm), but with the face and cheeks pale yellow. The legs are also lighter in colour. Both are introduced species.

Information on the habits and figures of the various stages of *C. denticornis* are given by Hamilton (1947).

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Lowland Insects on Mountain Tops

G. W. GIBBS and G. W. RAMSAY,
Wellington.

Three species of widely distributed lowland butterflies and the Australian eucalyptus tortoise beetle, *Paropsis dilatata* Er., have been observed at altitudes of 4,000–5,000 feet above sea-level in the Tararua Ranges during the summer of 1958–1959 by one of us (G. W. G.) employed there by the New Zealand Forest Service on their alpine ecological survey. Lowland insects are also reported from the summit of Mt. Egmont during January, 1955, from 4,000 feet in the Kaweka Ranges during February, 1957, and from 5,000 feet in the Kaimanawa Ranges during March, 1959.

The Red Admiral, *Vanessa gonerilla* F., was present on McIntosh in the Southern Tararuas at approximately 4,000 feet on January 21, and on Mitre at a similar altitude and in considerable numbers on March 8, 1959. One of these was observed feeding at flowers of *Dracophyllum uniflorum* Hook. f. Both localities were in scrub and tussock above the bushline. *Dodonidia helmsi* Fered., occurred in tussock country at a height of over 4,000 feet on the Dress Circle on January 19 and on McIntosh on January 21. Food plants and adults of both these species were present at lower altitudes in the Tararua Ranges, where the butterflies were probably breeding. Hudson (1928, p. 35) remarks that he has seen *V. gonerilla* between 4,000 and 5,000 feet in mountainous districts and that *D. helmsi* " frequents sunny glades in beech forest often at considerable elevations ". The above record of the latter species is therefore probably the first of its occurrence far above the bushline.

The White Butterfly, *Pieris rapae* L., was generally common above 4,000 feet in the Tararuas throughout January and February. On March 7 several specimens were seen in misty conditions at approximately 4,500 feet on Mitre.

The abundance of the White Butterfly was great enough to suggest that the species could be breeding on some alpine plant. However, no evidence of this was found despite constant searching, and it seems most probable that the butterflies originated from either the Horowhenua or Wairarapa Plains. The unusually favourable weather conditions in the Tararuas during this summer undoubtedly enabled the butterflies to survive in considerable numbers at the high altitudes. Numerous specimens of this species were also seen by Mr. D. Manson at 4,000 feet in the Kaweka Ranges on February 13, 1957, and at a lower altitude above " The Lakes " on February 12. Both these localities are far from the usual breeding places of this butterfly. During Easter (March 29), 1959, Mr. G. Caughley observed fifteen specimens at 5,000 feet along the tops of the

Kaimanawa Ranges, but none were present lower down in the bush.

It is probable that the White Butterfly occurs along the tops of most of the high mountain ranges of the southern and eastern parts of the North Island whenever the conditions are favourable. It is unlikely to breed there, however, and has not been previously recorded from such altitudes in New Zealand.

The eucalyptus tortoise beetle, *Paropsis dilatata,* first seen on Pukematawai at 4,800 feet on November 18, 1958, was observed quite commonly during January in the Southern Tararuas on Alpha (4,400 feet) and Hector (5,000 feet) flying in hot sunshine. This insect has recently appeared in the North Island again (Gurr, 1957), where it is apparently common and widespread, at least in the southern part of the island.

The large black wasp, *Salius monachus* Sm., occurred commonly at the summit of Mt. Egmont (8,260 feet) where it was flying in bright sunshine during January, 1955. It was not noticed in the bush lower down on the mountain slopes, but obviously must have been common somewhere in the surrounding Taranaki district, for such numbers to occur high on the mountain. Other insects were also common in the snow at the summit and areas nearby. These included many small species of Hymenoptera and Hemiptera, and a few beetles. All were dead and some had lain there long enough to absorb sufficient warmth from the sun to melt their way down into the snow, leaving a vertical shaft.

Other instances of lowland insects occurring high up on mountains in New Zealand are reported by G. V. Hudson (1906 and 1950) who records a large swarm of lady-birds, *Coccinella 11-punctata* L., at approximately 7,200 feet on the summit of Mt. Enys, and vast swarms of a species of *Pyronota* at 4,000 feet on Mt. Earnslaw. S. Hudson (1922) describes the occurrence of a swarm of lowland insects on a glacier at 7,500 feet on Mt. Ruapehu. She reports that many hundreds of specimens were present, most being dead or moribund, and that representatives of the orders Coleoptera, Lepidoptera (four families), Diptera, Odonata, Plecoptera, Trichoptera and Hemiptera were present. As far as can be ascertained, no other records of this phenomenon occurring in New Zealand have been published.

The subject has been reviewed by Chapman (1954), who cites examples of lowland insects occurring on mountains in Europe and North America. Many of these records concern the swarming of flies, beetles, and ants on mountain summits and ridges.

There appear to be very few records of lowland butterflies occurring on mountain tops. Chapman records nymphalid and pierid butterflies on Squaw Peak, 7,996 feet, in Montana and

Williams (1958) mentions examples of migrating butterflies crossing the Port de Gavarnie Pass, 7,500 feet, in the Pyrenees, and records a swarm of butterflies flying upwards over snow-covered ground at 10,000 feet on Dharmsala in India, and butterflies flying at 12,000 feet on Mt. Everest. Certain species of dragon flies, locusts, lady-birds, hymenoptera, syrphid flies and a pentatomid bug also form swarms which may sometimes reach great heights. However, these are examples of another phenomenon which is only interesting here in showing that these insects can reach great heights by their own controlled flight.

As regards lowland insects on mountain tops Chapman (1954) suggests that an "inherent tendency to seek prominent topographic features such as mountain summits is one of the bases of the phenomenon". There is little doubt that air currents can carry insects upwards for considerable distances above the land surface (Glick, 1939), but there is a considerable amount of evidence indicating that the concentration of species, present in surrounding areas, on mountain summits, cannot be attributed to the action of updraft air currents alone (Chapman).

It seems probable that the insects occurring high up in the Tararua, Kaimanawa and Kaweka ranges, and also the large wasp and beetles present on the summit of Mt. Egmont, were carried upwards partly by their own free flight and partly by the accident of suitable wind or air currents. The small Hymenoptera and Hemiptera, which were all winged, on the summit of Egmont, may have been carried aloft by wind or air currents alone, and possibly formed part of an aerial plankton.

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Notes on New Zealand Insects and Records of Introduced Species

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Entomology Division, Department of Scientific and Industrial Research, Nelson.

Coleoptera

In the collections of the Cawthron Institute, Nelson, is a carabid beetle, collected in Southland by A. Philpott, labelled The Hump, 6/2/12; on a label underneath in Broun's handwriting is the determination "3392 ♂ ", which is *Taenarthrus philpotti* Broun. The type specimen of this species was obtained by Philpott at the same locality in December, 1910.

Characters by which Broun (1914) differentiated his genus *Taenarthrus* from *Loxomerus* Chaud. are included by Jeannel (1938) in his conception of *Loxomerus*; Jeannel's description and figures of *L. capito* Jeann. correspond exactly with *T. philpotti,* so the latter becomes *Loxomerus philpotti* with *L. capito* a synonym. It is unfortunate that Broun, in his examination of *L. philpotti,* should have removed the genitalia from the 6/2/12 specimen, so making it impossible to tie in this last character of identification.

During January and February, 1960, a number of adults of the cerambycid *Coptomma variegatum* Fabr. was reared from a dying kowhai, *Edwardsia tetraptera* J. Mull., their occurrence being in the trunk and large diameter branches only, of a tree in a property adjacent to the Entomology Division Station, Nelson. Miller (1925) states that *C. variegatum* has been reared from tawa, and the writer has taken this species on Stephens Island, where tawa and kowhai do not occur, so additional host associations are possible.

Judging by the number of adults recovered, an Australian cerambycid, *Callidopsis scutellaris* Fab. appears to have become established in the North Island. Records of its occurrence, assembled from material in several collections are: Whakarara, Waipawa, Hawke's Bay, 20/12/35, F. Gardner; Pongaroa, Wellington Province, April, 1959; Wellington, Orongorongos, July, 1951, dead in log, D. N. Edwards; Palmerston North*, 4/11/56, J. I. Townsend; and Upper Hutt*, August, 1958, D. Manson.

The anthribid *Doticus palmaris* Pascoe, commonly known as the apple beetle, was recorded by the writer (1929) under the name of *D. pestilens* Oliff, from apple mummies and dry galls of

* Collected dead, in spiders' webs.

Uromycladium notabile McAlpine, on black wattle, *Acacia decurrens* Willd.; the figure given then of the adult beetle (p. 369) is that of a male and not a female. Bovie (1905), reduced *D. pestilens* to synonymy with *D. palmaris*.

Additional host records from Nelson city area can now be added, all from mummified fruits which were still attached to the trees, although some records go back for several years. Hosts are peach, *Amagdylus persica* Linn., almond, *Prunus communis* Fritsch, apricot, *Prunus triflora* Roxb., lemon, *Citrus medica* Linn., pomegranate, *Punica granatum* Linn. and loquat, *Eriobotrya japonica* Lindl.

On one loquat tree, a large proportion of fruits fail to mature properly, and these persist as dry mummies for at least two years. In the older mummies, larvae in all stages of development were present in midwinter, also a few adults were emerging. Larvae bore into and feed on the dry fruit-pulp area first, then transfer to the large thin skinned seeds where development is completed. With almonds, only a thin layer of fruit pulp adheres to the stone, yet several *D. palmaris* larvae can develop satisfactorily, while with increasing pulp content, up to the maximum found in lemons, the other hosts can support much larger field populations. *D. palmaris* can be considered one of the easiest subjects to rear under laboratory conditions, for, quite undisturbed, generation after generation in succeeding years can be produced in fruit mummies, until exhaustion of the pulp content occurs.

Amongst miscellaneous rearings by the writer, from host plants, are *Stephanorhynchus tuberosus* Broun, *Pactola variabilis* Pasc., *Tetrorea cilipes* White, *Chalcodrya variegata* Redt. and *Platycephala wollastoni* (Sharp) from small diameter branches of *Nothopanax arboreum* (Forst.), Third House 2,000ft, Dun Mt. Tramway, Nelson, January, 1938. *P. variabilis* and *P. wollastoni* were associated with the cambium area, while the others worked in cambium and into woody tissues, frequently pupating (*T. cilipes* and *C. variegata*) in the central, wide pith cavity. *Pseplolax simplex* Pasc. was cut out, as well developed adults, from larger branches of *Nothopanax arboreum*, 19/7/56, from the same locality.

Stephanorhynchus crassus Broun was reared in considerable numbers from seed capsules of *Pittosporum tenuifolium* Banks & Sol. from Forsyth Island, Pelorus Sound, 8/11/49, and also from seed capsules of *Pittosporum eugenioides* A. Cunn., Nelson, October, 1949.

The weevil known in New Zealand as Argentine wheat stem weevil, under the name *Hyperodes griseus* Hust., has been identified by Father Kuschel as *H. bonariensis* Kusch., who states also (*in litt.*) that *Asynonychus godmani* Crotch is a synonym of *A. cervinus* Boh.

Diptera

The principal larval food of *Arachnocampa luminosa* (Skuze) (Mycetophilidae) in the Roding pipeline tunnel at Stoke, Nelson, in January, is the adult tipulid *Rhamphophila obscuripennis* Tonn. These tipulids are caught by glutinous droplets on the dependent threads of the "web" of *A. luminosa*, whose larvae then suck out the fluid contents, so that perfect specimens of *R. obscuripennis* may be recovered after this devitalisation.

During the last three years there has appeared in Nelson, a large sarcophagid fly, identified by E. O. Pearson of the Commonwealth Institute of Entomology as *Sarcophaga crassipalpis* Macq., who remarks (*in litt.*) "This species is mainly Holarctic but is known from Australia (the only Australian species with red genital segments)". Previously unrecorded in New Zealand, *S. crassipalpis* has been collected at Nelson in large numbers and occurs in the surrounding districts; it has also been reported, in May, 1959, to be not uncommon at Gisborne and often seen about the beaches. Distribution in North and South Islands is probably already very extensive.

Heteroptera

In describing *Phthirocoris magnus*, Woodward (1956) refers to specimens taken by the writer at Auckland Islands, which he assumes to be this species; these have been compared with Woodward's description and are *P. magnus*.

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Control of the Scaly Leg Mite in Poultry with Some of the Newer Insecticides

A. D. LOWE,

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Cnemidocoptes mutans Robin, the "scaly leg" mite of poultry, lives beneath the scales of the birds' legs, causing encrustations and lameness, and often leading to bleeding and secondary infections in the exposed tissues. The birds develop long, misshapen claws due to lack of normal foraging and in severe cases the general loss of vigour depresses laying and normal flock activity. Both male and female birds may be affected.

Cleland (1953) briefly reviewed the current remedies, considering them somewhat painful, and suggested that painless and more satisfactory control was possible with DDT or lindane.

These suggestions had not then been tried alongside untreated control birds for comparison, and in 1955, when some badly infected birds became available, it was agreed to undertake a small trial against this mite.

While this project was being completed, the author's attention was drawn to the work by Ghidini (1947) with DDT in Italy, and by Griffiths and O'Rourke (1951) in Britain with benzene hexachloride. In both cases successful control of the infesting mite was claimed. Blount (1947) also suggests the use of BHC.

Materials and Methods

Eight birds were available for this trial, and the materials chosen were DDT and lindane. Almost pure lindane (99–100% gamma isomer) and DDT (95 100% p.p.i.) were dissolved in raw linseed oil to give a solution in each case of 0.5% (w/v) of the insecticide. This was painted on one leg of each fowl with an upward stroke of an ordinary $\frac{1}{2}$-inch brush to achieve penetration between the scales. Treatment was applied in April, 1955, and judgments of the result took place after 2, 5 and 10 months. Results are indicated in Table A (Trial I).

At the end of 10 months, it was evident that the treatment had become ineffective, and that re-infestation of the treated legs had taken place, possibly from the untreated ones.

A further 4 birds were obtained and a second trial laid down in which the 12 birds were divided into 3 batches of 4, and treatment applied to both legs of each bird in the DDT and lindane treatments, while 4 birds remained untreated. Judgments were made after 2 and 5 months, and results are set out in Table A (Trial II). At the end of 5 months it was no longer convenient to maintain the birds and this trial was terminated.

Throughout both trials, all birds were housed in a common run, and the legs of control birds in both trials were treated with linseed oil only.

Results

The judging of results is complicated by several factors. (1) The mites cannot be actually counted without destroying the birds, removing and dissecting the legs, where they are deeply embedded in the tissue. The destruction of the birds used was not possible as they were required for other purposes. (2) Some birds appear to be naturally resistant to the mite and never suffer anything other than a very mild infestation. In the second trial, three such birds were available in the flock, and one of these was included in each treatment. At times of judging (Table A) each bird was given a percentage rating for its degree of infestation by the mite. Percentages of infestation were estimated for each bird visually, and figures shown in the table represent a mean value for the four birds. (3) There is some seasonal fluctuation in the intensity of infestation in birds, and this is shown in the increasing degree of infestation in the untreated flock (Trial 1).

The illustrations accompanying this report are photographs of the same bird before and after treatment.

It appeared typical of this treatment that the worst affected birds show the best degree of recovery. This is probably due to the greater degree of penetration possible in such cases, where the leg scales are forced apart by the presence of large numbers of mites.

Conclusions

There appears to be no doubt that a painless and simple system giving reasonable control of scaly-leg in poultry is possible with the newer insecticides, without the troublesome and painful effects of the older treatments. In these trials lindane gave better control than DDT.

No tests have been carried out to determine whether lindane applied in this way will taint the flesh of, or the eggs laid by, treated hens. Although it is felt that such risk of deleterious effects is very small, it is hoped to continue with this work to determine these points.

A badly affected bird photographed before treatment, and 117 days after treatment with lindane in oil. Note heavily encrusted scales and long claws before treatment.

Table A

Trial	Date	Degree of Mite Infestation (Mean of 4 birds)		
		Lindane	DDT	Untreated
I	21/4/55 (treated)	80%	80%	80%
	21/6/55	20%	45%	80%
	12/9/55	25%	80%	80%
	22/2/56	80%	90%	90%
II	16/4/56 (treated)	80%	80%	80%
	21/6/56	20%	40%	80%
	4/9/56	35%	75%	80%

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Miscellaneous Collecting Notes for the 1959-60 Season

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Mistaken Identity

In the last number of *The New Zealand Entomologist* (p. 25) the writer published a note on sounds produced by larvae of the longhorn *Tetrorea cilipes* White. The host tree was identified by him as *Carpodetus serratus* Forst. However, R. Zondag, of Forest Research Institute, Rotorua, has pointed out that this determination was probably incorrect. A sample of the wood was sent to J. M. Harris, of Forest Research Institute, for a check identification, and it proved to be a *Nothopanax* species. Trees of this genus were growing in the area as well as *Carpodetus serratus*.

Strange Behaviour of Carabid Beetles

Actenonyx bembidioides White is a small carabid 7–9 mm long which occurs commonly throughout New Zealand. A favourite habitat for these beetles is near the margin of streams, particularly those with a coarse gravel bed. The Kahutara River, five miles south of Kaikoura, provides such conditions, and it was here, on January 10, 1960, that the following observations were made. As usual, specimens of *Actenonyx* were seen running rapidly over the stones. Plants of introduced broom, *Cytisus scoparius* Link, were growing along the river banks, and their seeds were scattered amongst the shingle. The beetles were attracted by these golden brown seeds and several were seen carrying them. A beetle would grasp a seed with its mandibles and run backwards dragging it along in a manner similar to that of a wasp (e.g., *Salius* sp.) transporting a spider. The point at which seeds were gripped was at the soft hilum, as the rest of the surface was hard and smooth, allowing little purchase. Although the beetles were watched for some time their movements seemed completely haphazard. They would carry a seed a distance of perhaps a foot or more, drop it, run around at random, ignore other seeds in the area and then return to the same seed to carry it a stage further, but apparently in no particular direction.

Other beetles that were not actively carrying seeds could not be induced to do so when broom seeds were placed near them. Little is known of the feeding habits of *Actenonyx*, but carabids of this type are generally assumed to be predaceous, feeding on small invertebrates. When caged with broom seeds that they had already transported, they made no attempt to feed on them. An interesting observation was that only certain broom seeds were

attractive to the beetles. The significance of this behaviour was not elucidated. The writer would be pleased to hear from others who have observed similar activities, or who may have an explanation to offer.

Rediscovery of *Neoferonia prolixa* (Broun) (Coleoptera: Carabidae)

Eight specimens of the rare carabid *N. prolixa* were collected at Lower Hollyford River, Fiordland, on January 21, 1960, by J. Balderson. According to E. B. Britton (1940) this species is known only by a single male in the Broun collection at the British Museum. There were no specimens of this species in the A. E. Brookes collection, Cawthron Institute, or Entomology Division collections. The type locality is Martin's Bay, West Otago.

It is a more elongate species than its closest ally, *N. integrata* (Bates) and, as Britton (1940) states, it can at once be separated by the male genitalia, which are illustrated in his paper. As the ventral paramere of the genitalia of *N. integrata* shows considerable variation, the most reliable character for separation of the two species appears to be that in *N. prolixa* the aedeagus when viewed from above is apically angulate.

Calotachina tricolor Malloch (Diptera: Tachinidae)

Twenty-two specimens of this fly were taken on Mt. Owen, Nelson, on February 25, 1960, by W. P. Thomas and the writer. They were swept from tussock at about 4,300 feet in a sheltered valley known locally as "The Pass" a little north of the main peak. It was noticed that they had a peculiar slow flight, more like a beetle than a fly. An additional specimen was taken on March 20 by the writer from Mt. Hope, at 4,000 feet, while others were seen. Mt. Hope is in the same mountain system, being approximately eight miles further south.

The specimens were compared with Malloch's type. In his description of the genus *Calotachina*, Malloch (1938) states, "The first posterior cell of the wing is open and the fourth vein has a spur vein on its inner side between the angle and its apex. This last character may not be normal." The series shows that, as he suggested, this character is not constant; the greater majority of specimens (16) have the spur vein present, in some (2) it is only just distinguishable, and in others (3) it is entirely absent. One specimen has it present on the left wing and absent on the right. Five specimens show in addition to this spur vein on the inner side a short spur vein on the outer side of the fourth vein at the angle. Again, one specimen shows this character on the left wing but not on the right.

This insect was previously known only by the type which was collected on the Mount Arthur Tableland in 1925 by A. Philpott.

The type specimen is in the Cawthron Institute collection. The series from Mt. Owen and Mt. Hope is in the Entomology Division, D.S.I.R.

An Undescribed Aradid Bug

A series of thirty aradid bugs was taken at night, with the assistance of Mrs. M. Anderson, from the trunk of a small tree in forest at Mt. Algidus Station, Upper Rakaia River, Canterbury, on December 11, 1959. The insects were later identified with the genus *Calisius* Stål by the keys of Usinger and Matsuda (1959). These authors state on page 94: "The distribution of *Calisius* shows a curious pattern. No species have been described from the Oriental Realm and the only 'Nearctic' species are two from Florida. On the other hand, two species occur in Europe and one reached the Baltic judging by an excellently preserved specimen in amber. The dominant areas for the genus appear to be the Neotropical with 7 species (9 incl. Florida), the Ethiopian with 5 species, and the Australasian Realm with 16 species described and many undescribed species. Only two species are known from Australia, the others being from New Guinea, Micronesia and Polynesia. A single undescribed species is at hand from New Zealand." Quite possibly the series just found will prove to be identical with Usinger and Matsuda's undescribed species. Material will be submitted to them for verification. The closest species geographically are *C. annulicornis* Bergroth from Tasmania, *C. interveniens* Bergroth from Australia and *C. pacificus* Stål from Fiji.

Briefly, the genus *Calisius* is characterised by the following features. The genae are not produced on either side of the clypeus to form a cleft. The three dorsal abdominal scent glands are equally well developed. The rostrum arises from well behind the apex of the clypeus and there are well developed buccal plates. The metapleuron is without a large deep scent gland in front of the hind coxa. The scutellum is greatly enlarged. The species are all of small size (less than 5 mm long).

Assistance with the identification was given by E. S. Gourlay.

Hemideina alterna Salmon (Orthoptera: Stenopelmatidae)

Several specimens of a "weta" were found under stones near the summit of Mt. Algidus at 4,600 feet in December, 1959. They were morphologically the same as *H. alterna*, being a dark form of that species. Salmon (1950) states: ". . . . in older specimens, particularly the males, the ochreous ground colour of the body darkens to a reddish-brown, and the dark-brown transverse bands become almost black, giving the insect an overall dark brownish-black appearance. Some specimens are entirely black; . . ." He does not specifically record any locality where dark varieties may be obtained. All specimens seen at the summit of Mt. Algidus

(including quite immature ones) were dark coloured. Typical forms showing the light ochreous banding on the abdomen have been seen by the writer at the Hermitage, Mt. Cook and Porter's Pass, but the above locality is the only place where he has seen the dark form.

Helpful advice was received from G. W. Ramsay regarding specific characters used in the identification of these wetas.

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Artificial Egg-laying Sites for the Common House-Borer *Anobium punctatum* De Geer

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Anobium females prefer to lay their eggs on rough surfaces, and hence the majority of eggs are always deposited on the end grain surface of blocks. Although these surfaces are very favourable for egg-laying, their roughness and the tightly overlaid fragments make it tedious and sometimes difficult to obtain accurate counts of the number of eggs present. This difficulty can be overcome by providing suitable artificial sites as was done by Kelsey (1946), who gummed pieces of muslin to the block surface, the interstices in the weave providing acceptable sites for egg deposition. In my investigations I have repeatedly used a most satisfactory but hitherto unpublished method which requires neither gum nor muslin and allows the female to deposit eggs directly onto the wood surface. In this method suitable egg-laying sites are imprinted onto the block surface with a steel die. Each egg-laying site is made by a right pyramid 0.025 inches high, with square base 0.025 inches x 0.025 inches. On the dies most used the base of one

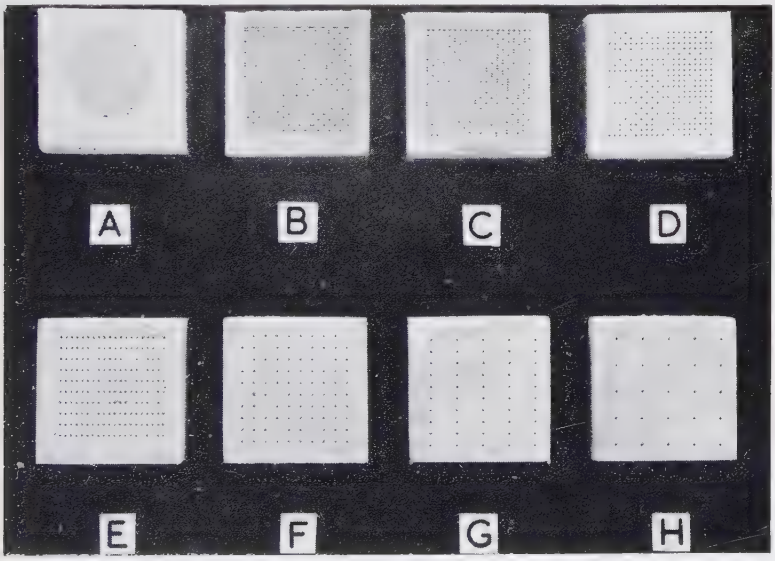

FIG. 1.—Blocks imprinted with various dies. a, disc 0.8in diameter, 1600 sites square inch; b-h square area 1in x 1in; b, 1600 sites; c, 800 sites; d, 400 sites; e, 200 sites; f, 100 sites; g, 50 sites; h, 25 sites.
Photo: S. Rumsey.

pyramid meets the base of the four surrounding pyramids, and there are thus 1,600 pyramids to the square inch, these occupying either a disc 0.8 inches in diameter (Fig. 1a), or one square inch (Fig. 1b). For some experiments, other dies have been used in which each pyramid is separated (on two or four sides) by a flat area from adjoining pyramids, providing 800, 400, 200, 100, 50 and 25 pyramids on a square inch. (Fig. 1c, d, e, f, g, h).

The sites may be imprinted with equal facility on either side or end grain; the sites on end grain are perhaps more precisely formed and retained, but appear to offer no extra advantage as egg-laying sites. The wood blocks may be any convenient size or shape; those in the illustrations are approx. 1.3in x 1.3in x 0.5in. Blocks of this

Fig. 2.—Block 1.3 x 1.3 x 0.5 inches, and Type IV cage showing method of assembly.

Photo: S. Rumsey.

size, imprinted with the disc die (Fig. 1a) are commonly used with a Type IV cage (Spiller, 1948). This combination (Fig. 2) is particularly useful for experiments on egg-laying or egg-handling.

The dies perform best against a smooth, flat surface. But this is necesary in any case if, as is usual, it is convenient to have egg-laying confined to the area of artificial sites.

Usual practice is to cut the blocks to size and then sand-paper the required surface smooth and flat on a power driven disc sander. The steel die is then positioned on the sanded surface, a steel backing plate placed on the other surface and the sandwich pressed in a small screwpress. Blocks are then stored and used as required.

These egg-laying sites are completely acceptable to *Anobium* females which, indeed, sometimes choose the artificial sites in preference to rough or natural egg-laying surfaces. In practice an *Anobium* female usually deposits one egg in each site (Fig. 3a and b); this is hardly surprising, the size and shape of each site being based on the dimensions of *Anobium* eggs. Occasionally a second egg is deposited on and between the first egg and the corner of the egg-laying site, and rarely a cluster of three or more eggs

occurs. Because the eggs always occur in symmetrical rows and columns there is never the slightest difficulty in counting the total number of eggs on a block, and further, the eggs do not have to be picked off or disturbed. Counting is usually done under a low

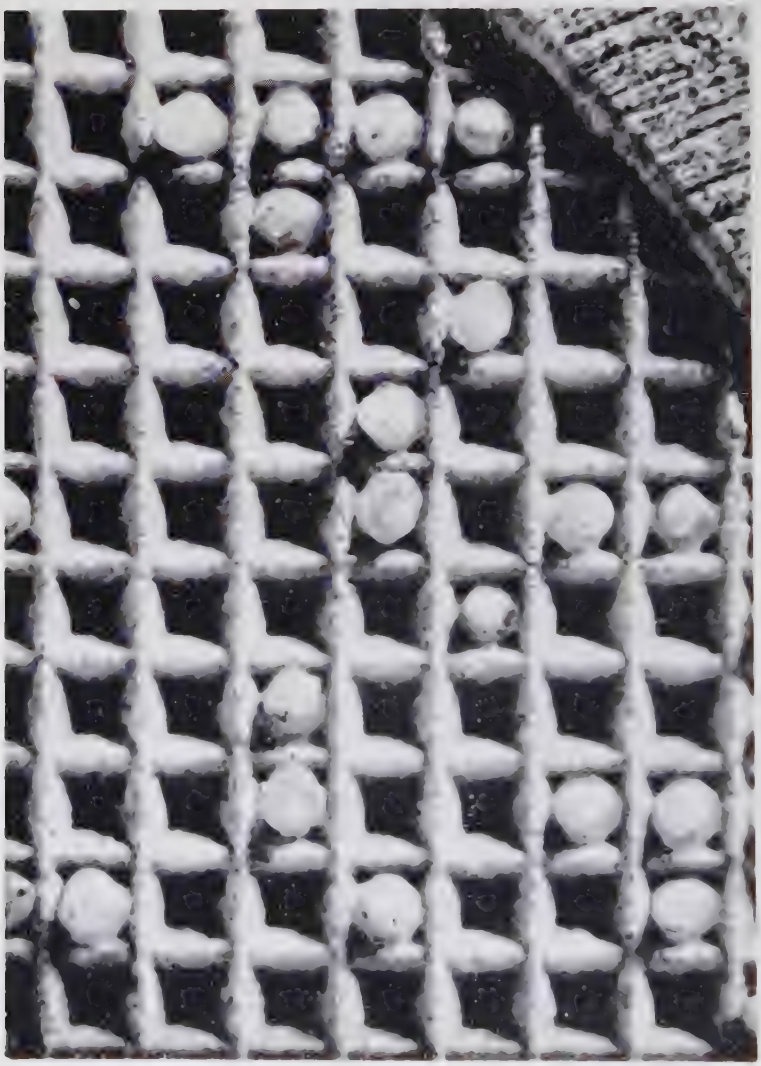

FIG. 3.—(a) *Anobium* eggs deposited on an area of artificial egg-laying sites (× 3 natural size). (b) An enlarged view of eggs and sites (× 20 approx.).

Photos: S. Rumsey.

power stereoscopic microscope, the block being moved across the stage by hand. When there are large numbers of blocks to be counted it is sometimes worthwhile to use a stage having side to side and fore and aft movements, and to mark out the rows to be counted with two thin parallel wires positioned just above the block surface. These wires are mounted on a light frame attached to the microscope head, and remain fixed in the field when the microscope is focused or the block searched.

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Two Beetles from the Bark Scales of Rimu (*Dacrydium cupressinum* Soland.)

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The biologies of *Euderia squamosa* Broun (Bostrychidae) and *Sommatidia antarctica* White (Cerambycidae) are discussed with particular reference to distinguishing their infestations. The information recorded is a result of two years of rearing small numbers of these two species in the laboratory combined with periodic field examinations in Nelson and Westland Forest Conservancies.

Euderia squamosa was described by Broun[1] as an anobiid, but he suggested that morphologically the species seemed to fall somewhere between this family and the Bostrychidae. These two families belong in different sub-orders of the Coleoptera and, if Broun had been correct, a new sub-order would have had to be erected to contain this single species. Its true position was defined by Lesne[2]. Collections by Hudson[3] have been made by beating rimu foliage, but hitherto no information of its habits or habitat has been recorded.

The adults emerge from old bark scales of rimu from late October to January, peak emergence being in December. The exits are mainly on the outer surface of the bark, but some occur on the under surface where the bark scale has lifted away from the tree. The holes are round and 1.0–1.2 mm in diameter. The beetles are sedentary during the day and rest on the bark and foliage where mating takes place in the evening. They are well camouflaged for a rimu bark background. The eggs are laid in the rough surfaces of the bark, or within old pupal chambers, and hatch in 14–23 days. The short-legged, white larvae are moderately hairy and typically curl up on removal from their tunnels. They feed for about 10 months, moving in relatively straight lines toward the top of the tree, and construct pupal chambers close to the surface of the bark. The pupal period averages about 19 days, but the beetles remain in the pupal chambers up to 10 days before emerging.

Collections have also been made from *Podocarpus dacrydioides* A. Rich. (Kahikatea), but the insect is more common on rimu. In collecting material to study this species, cerambycid larvae were frequently found occupying the same habitat and doing similar damage. Rearings proved this to be *Sommatidia antarctica* White. The adults of this species also emerge in December and construct round exit holes which, however, are twice the size of those of *E. squamosa*. The eggs are laid in roughened bark, only one or

two being placed together. *E. squamosa* appears to deposit eggs singly, seldom in pairs, though several may be laid in the same bark scale. The incubation periods for both species occupy the same range and the larvae feed about the same length of time. The larvae are markedly different on close examination, though the early stages may be confused at first. Larvae of *S. antarctica* are relatively smooth, creamy-coloured, and taper posteriorly from the thoracic segments. They do not curl up on removal from their tunnels. Whereas their tunnels are oval, those of *E. squamosa* are round, but both pack their frass tightly behind them as they progress through the bark. The pupal chambers of *S. antarctica* are larger in all dimensions. The pupal period for this species is similar to that reported for *Euderia*. From material collected, *E. squamosa* appears to be more common in rimu bark scales than *S. antarctica*. Whereas the latter has been reared from *Pinus radiata* D. Don. also, *Euderia* has only been obtained from the two podocarps mentioned above and seems to be distributed throughout the range of its host plants.

Though the life-cycles of the two beetles are similar, particularly in the timing of major events in development, certain features have been described which permit differentiation of the two infestations. Larvae of both insects have been taken from close proximity within the same bark scale. The larva and pupa of *E. squamosa*, not previously described, have been sent by Mr. E. S. Gourlay to R. A. Crowson, Glasgow, at his request, for description.

I wish to thank Mr. E. S. Gourlay, of D.S.I.R., Nelson, for his identification of these insects and for information about publications containing relevant data.

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The Comparative Biologies of Certain New Zealand Cerambycidae

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Summary

The life-histories of several cerambycid species are described and compared, the information recorded having been compiled from field observations and laboratory rearings. The duration of the life-cycle of any one species may show considerable variation, which appears to be influenced by the moisture content of the wood in which development takes place.

Introduction

The large family Cerambycidae, or longhorn beetles, includes species which attack living trees, species which feed in dying and dead trees and species which complete their development in wood varying from seasoned timber to that in different stages of decay. Those which attack living trees in New Zealand are fortunately few in number, though *Navomorpha lineatum* F. causes damage to Douglas fir by boring into, and eventually girdling, branches and sometimes the terminal portion of the main stem. *Oemona hirta* F. is a noted pest of unthrifty citrus and has become known as the "lemon tree borer", while *Ochrocydus huttoni* Pasc. damages the main stem of *Leptospermum* spp. Most species feed in the phloem and outer sapwood of dying and recently dead or felled trees. Some of these enter the wood at various stages of larval development, becoming true wood-borers, others enter the wood only to pupate, while some penetrate no further than the inner bark. *Sommatidia antarctica* White may exist entirely in bark scales while other species, immediately after eclosion, enter the wood in which they spend their entire immature stages. These latter species include *Ambeodontus tristis* F. the "two-toothed longhorn", one of the economic timber pests of New Zealand.

The purpose of this paper is to record observations made and experimental work done by the author on certain cerambycid species native to New Zealand. While admittedly incomplete, it is hoped that the information may have some value for workers interested in the Cerambycidae.

Techniques

In addition to regular field examinations, infested branches and small logs were kept in the laboratory. These were split along the line of larval activity and the pieces then placed together

and held in position by rubber bands or tape. They were kept in quart jars and larger rearing cages in which different moisture contents of the wood were maintained by varying the frequency and amount of water added to each specimen. Monthly examinations were made and as larvae ceased feeding, several of each species were removed to glass tubes containing cotton wool so moistened with water as to provide a relative humidity within a satisfactory range. Development in the pupal stage was followed in detail.

General Development of Cerambycids

Individual life-cycles may vary both in the same and in different species. From a batch of eggs from one female of *Prionoplus reticularis* White, some larvae develop to adults in two years, most take three years, and some do not pupate in this time, though apparently under the same environmental influences. Of the environmental factors determining the duration of the life-cycle, water content of the wood was found to exercise an important influence. Laboratory work showed that where infested wood had a moisture content of 40 per cent. to 100 per cent., based on the oven-dry weight, larval development proceeded satisfactorily. In wood with a moisture content of less than 25 per cent., the larvae of *P. reticularis* died after one year, the first mortality recorded being just over three months from the date of eclosion. In branch sections where the moisture content of the wood was 29 per cent., *Tetrorea cilipes* White and *Hexatricha pulverulenta* Wwd., emerged in two years and four months, but were significantly smaller than the average size of those reared in less than two years from wood with a moisture content above 40 per cent. It would therefore appear that wood moisture contents of less than 30 per cent., both increase the length of the life-cycle and decrease the adult size of cerambycids which develop therein. Moisture contents below 25 per cent are eventually lethal to the larvae of *P. reticularis*. It was also found that increasing the moisture in tubes where pupae were developing resulted in deformities associated with the inability of the adult to shed the pupal exoskeleton properly. In most instances recorded, the elytra and wings were affected but occasionally a leg did not complete development. Pupal mortality increased under conditions of both high and low moisture. In the former, fungal moulds appeared to be the main factor involved, while in the latter it was desiccation.

The eggs of cerambycids are white to cream-coloured when laid, but those of a few species may darken later. They are usually two to three times as long as wide and elliptical in shape. Those species which lay eggs in batches, such as *P. reticularis*, have eggs that appear somewhat straight-sided and pointed on the ends. When laid singly they are elliptical and about 3 mm x 1.2 mm. The eggs of *T. cilipes* are white when laid and have conical ends.

Most of the species which lay their eggs under bark scales and along bark crevices have eggs in which the contents do not fully expand their chorions. These eggs take on the shape of the crevice in which they are deposited.

The incubation period of eggs varies between 14 and 30 days, depending on the species. In most cases, eggs laid by one female on the same day hatch within four days of one another. Hatchings of a single batch of eggs of *P. reticularis* are sometimes spread over two weeks.

Larval development in the species studied occupied one to three years and the pupal period was 15–25 days. In general the pupae undergo the same stages of development irrespective of the species. The pupal chambers were all found to be constructed along the longitudinal axis of the infested wood and the pupae were orientated with their heads towards the top of the tree and their dorsal surfaces toward the centre of the tree. If the infested wood was lying on the ground, the dorsal surfaces of the pupae were toward the ground. Pupae, held in tubes, usually rest on their backs, but regular movement on to their sides and back again was observed. Pigmentation commences in 5 to 9 days when the eyes become pink, gradually darkening to black in a further 5–12 days. The order of pigmentation of other parts are mandibles (commencing at the tips), leg and tarsal joints (commencing with the joint of the femur and tibia), pronotum, claws, other thoracic sclerites, ventral abdominal sclerites, pygidium, elytra and head. The final ecdysis occurs during pigmentation, usually a few days after the eyes become black. In 12-24 hours following the moult, the wings and wing cases are expanded to full size, and in 2–4 days reach full pigmentation.

Following the final moult, the adults continue development for 5–14 days, the enlarged abdomen being last to retract to its final size. The beetles then remain in their pupal chambers for two or more days before commencing emergence from the wood. In certain species which pupate in the autumn and early winter, the adults overwinter in the pupal chambers.

Habits of Some Adult Cerambycidae

The New Zealand Cerambycidae include species which attack a wide range of tree species as well as species which have a restricted host range. *Prionoplus reticularis* and *Stenopotes pallidus* Pasc. attack a number of conifers but have not been recorded from hardwoods. *Didymocantha* spp. are restricted to the southern beeches (*Nothofagus* spp.). *Coptomma variegatum* F. has a wide range of hardwood host species, while *Hexatricha pulverulenta* attacks both conifers and hardwoods. The latter, which was once common in mixed podocarp/beech forests, has moved into

man-made pine forests where it develops in the phloem/cambial tissues of dead pine trees and logs (Gourlay, 1951).

Activity patterns of most New Zealand longhorn beetles are related to decreasing light intensity. *Sommatidia, Tetrorea* and *Hexatricha* emerge in the warmest part of the day, but apart from crawling on tree trunks are mainly sedentary during daylight. Pairs of *P. reticularis* have been found mating under pine logs during the day and *T. cilipes* has been observed chewing the soft bark around buds of *Griselinia littoralis* Raoul at midday. If disturbed during daylight, cerambycids will stand and defend themselves or crawl away, but will seldom fly. In the evening they are most active and will fly off at the slightest disturbance. Most species apparently mate following evening emergence and the females deposit most of their eggs on subsequent nights. Adults could not be induced to mate in glass tubes. In most cases the sexes fought and damaged each other. Mating did occur in large tins and fertile eggs were laid. In general the number of eggs laid under laboratory conditions was fewer than that recorded in the field, and it would appear that there may be a conditioning flight period necessary before significant oviposition occurs. Each male and female may mate several times before females oviposit. Oviposition habits vary both in the sites selected and in the number of eggs deposited together.

P. reticularis commonly lays large batches of eggs under loose bark, between recently sawn boards and other timbers stacked together, and smaller batches in the exit holes and entrance tunnels of the larger wood-boring insects. Most of the species studied place only a few (usually 1–3) eggs together but sometimes a number are laid in a line along bark-fissures or wood-checks. A few species, including *A. tristis,* may re-enter their own pupal chambers to lay 1–5 eggs, while females of *Tetrorea* spp. sometimes chew small patches of soft bark and oviposit one or two eggs in such roughened bark on twigs and small branches. A female of *P. reticularis* may lay up to 120 eggs while single females of *T. cilipes* and *S. pallidus* usually lay between 40 and 60 eggs each.

Specific Life-cycles

Sommatidia antarctica White. Adults commence emerging in late December and continue to early February. The eggs are laid in roughened bark of rimu (*Dacrydium cupressinum* Soland.) and other softwoods and hatch in 14–20 days. The larvae feed within the bark scales and pupate at the end of their tunnels in prepared pupal chambers in late October and November. The pupal period to the moult averages about 16 days, and adult development continues for 5–8 days. Emergence of adults from the bark occurs variously up to 34 days following the commencement of pupation.

Adults of *S. antarctica* have been reared from *Pinus radiata* D. Don., *Podocarpus spicatus* R. Br. and *P. dacrydioides* A. Rich. in addition to rimu. As it is round in cross-section through the abdomen, this species constructs round exit holes in contrast to those of many other longhorns.

Stenopotes pallidus Pascoe. Earliest recorded emergences were in late September, though most adults emerge between early December and late January. Mating has been observed on tree trunks during the evening and eggs are deposited in bark crevices under the raised edges of the bark. The incubation period ranges between 15 and 26 days, most hatching occurring in 18–21 days. The larvae feed for some time in the phloem/cambial tissues of dying, dead and recently felled trees. They enter the wood about half-way through larval development, becoming wood-borers. Their tunnels are packed tightly with frass. Pupal chambers are constructed in the wood and open to the inner bark. The pupal and teneral adult period ranges between 27 and 32 days. This species has been reared from *Podocarpus totara* D. Don., *P. ferrugineus* D. Don., rimu and larch (*Larix* spp.).

Development from egg to adult takes about 14 months, so that overlapping broods may occur in this species. The spring-laid eggs apparently produce adults in late summer about 14 months after oviposition, and late summer and autumn eggs give rise to adults in the spring 18–20 months later.

Hexatricha pulverulenta Wwd. The adults of this lamiid emerge from late September to December. They are sedentary during daylight, often on the trunks of trees, but become active towards early evening. Mating and oviposition have not been observed, but by tracing back along larval tunnels in the bark, oviposition sites have been found. The females of this species appear to chew a groove along existent bark fissures or around the edge of bark scales and then to deposit one or two eggs in this groove. Jeffreys (1939) has described the morphology and certain of the habits of this species in greater detail than given here. The larvae feed in the phloem, eventually penetrating the outer sapwood as they grow. They pack their tunnels tightly with frass and prepare large, broadly-oval pupal chambers which are almost opened to the outside so that the adults chew away very little bark when ready to emerge. The exits are round, with ragged edges. The pupal period varies from 18 to 25 days, followed by 5–12 days of adult development, and emergence from the bark takes place 2–8 days following complete metamorphosis.

While the incubation period has not been established, the period from adult emergence to early larval activity of the new brood indicates that this is between 14 and 26 days, depending on the

temperature, as it is in *S. pallidus*. This species has either a one- or a two-year life-cycle from a single oviposition. The period from oviposition to adult emergence being apparently similar to that for *S. pallidus*. It attacks dead and dying trees of silver beech (*Nothofagus menziesii* Oerst.) and hard beech (*N. truncata* Cock.) as well as *Pinus radiata*.

Tetrorea cilipes White. Though this species has been reared from the trunks of lower canopy or secondary hardwoods such as *Nothopanax arboreum* Seem. and *Griselinia littoralis*, it is apparently more common as a twig and small branch borer. The larvae often feed along the line of the pith, the tunnel, in contrast to those previously described, being kept relatively clear of frass for some distance behind the larva. Pupation takes place in a section of the tunnel almost opened to the outside and lightly blocked off at both ends by coarse wood frass. The adults emerge from November to late January and eggs are laid singly or in twos and threes in small patches of chewed bark on twigs. The incubation period varies between 16 and 25 days, averaging about 19, and, as in *H. pulverulenta*, some adults emerge in one year and others in two years. The pupal and adult development periods together average about 28 days, with a range of 24 to 36 days.

T. maculata Broun is a twig and small branch borer in silver beech, but the larvae construct a meandering tunnel in the wood and pupate in the wood just below the bark.

Didymocantha picta Bates and *D. quadriguttata* Sharp have been reared from all the species of *Nothofagus*. They usually have two-year life-cycles, but some take longer where moisture is critical. Late-stage larvae have been kept for three years in wood with a moisture content of 22 per cent (based on the oven-dry weight) without completing development. Adults emerge from late August in warm sites to January in cooler sites. The eggs are laid in bark crevices in a similar manner to that described for *S. pallidus* and the incubation period is also comparable. The early larvae may spend some time in the phloem, while others enter the wood at a relatively early stage of development. Feeding ceases and pupal chambers are constructed in the summer of the second year. Pupation occurs from April onward, and fully developed adults can be found in the wood in June. The pupal chambers are often relatively deep in the wood with exits into the bark. The pupal and teneral adult periods together average about 34 days, but adults may not emerge for several months.

Prionoplus reticularis White, the Huhu, usually has a three-year life-cycle, but a few adults may emerge in two years while other larvae of the same brood may not pupate for more than three years. The adults emerge from the dead and decaying wood of a variety of softwood species, peak emergence occurring in November and

December. The eggs are usually laid in large batches under loose bark, between pieces of stacked freshly-sawn timber, and in exit holes of wood-boring insects. They take 16–25 days to hatch. Larval activity in pine is such that layers of summer wood may be removed in curved sheets due to destruction of the soft spring wood. Pupal chambers are constructed from August onward, and most pupation takes place in October and November, the pupal period being about 20–24 days, followed by 10–14 days of adult development. Adults emerge two or more days later. Late stage larvae prepare emergence tunnels into the bark.

Blosyropus spinosus Redt. From limited observations and collections it would appear that this species has a similar life-history to that of *P. reticularis,* differing mainly in the time of pupation and main emergence, and in the construction of pupal chambers. Adults have been taken from dead "grass trees" (*Dracophyllum traversii* Hook. f.) in June. Examination of the workings of the larvae show that the eggs are laid in the tops of the dead grass trees. Tunnelling proceeds downward until the large pupal chamber is constructed in the base of the stem at, or slightly below, ground level. These chambers open to the outside but are blocked by a loose plug of coarsely chewed wood that has not passed through the alimentary tract. Emergence begins in late August, though emergence from red beech (*N. fusca* Oerst.) at Reefton, has been observed as late as February.

Discussion

While some of the information given here has not been replicated, in most instances numbers of larvae and adults have been reared. Most species were also observed in the field, and the two sets of records have been combined for the timing of events in the life-cycles, to try to eliminate any effects peculiar to laboratory rearing. This has resulted in wider ranges for the incubation and pupal periods than laboratory rearings indicate. In the incubation of eggs of the several species reported, most hatching occurred in 16 20 days. In some instances where two eggs, laid on the same day, hatched a week apart, no environmental effect could be found to explain the difference. Thus it would appear that there is a natural variability in the incubation period of the eggs of some cerambycids, in addition to the effects of varying environment. Apart from initial hiding of the eggs by females, there is no care of eggs by adults. On eclosion the larvae chew through the chorion and directly into the bark or wood to which the eggs are attached. The length of the larval period varies considerably, resulting in a wide range in the time of pupation, particularly in the true wood borers. The average pupal period of about three weeks is followed by a varying period of adult development and an even more

variable period of resting within the pupal chambers. Some species such as *Didymocantha* spp. and *Blosyropus spinosus* appear to hibernate or overwinter in their pupal chambers, after completing metamorphosis. The adult life-span varies considerably with the species as well as with the sex. Some females of *P. reticularis* and *H. pulverulenta* have lived a month without feeding, others died within 15 days. In general males live between 5 and 12 days, though a few die in 2 days, while others live almost as long as the females. Adult activity is closely related to light intensity, decreasing with higher and increasing with lower intensities. Feeding by adults has rarely been observed. *Tetrorea* spp. chew soft bark around buds, and several species held in cages frequently visited water droplets on bark. It is, however, possible that daily feeding by New Zealand longhorn beetles is more common than these limited observations indicate. The adults are seldom sufficiently stimulated during the day to take flight, most prefer to stand and defend themselves or to walk or run away. Some, like *H. pulverulenta*, stridulate strongly on being picked up, and most can nip sharply with their mandibles. In the evening they are easily disturbed, take flight readily, and some, such as *P. reticularis*, make a loud buzzing noise during flight.

In the life-histories of the members of the three Cerambycid sub-families studied here, the incubation of the eggs and the pupal periods are comparable, having similar ranges. The main differences are in larval habits. Of note are the tissues eaten by the larvae, the length of the feeding period, and the mode of construction of pupal chambers and exit tunnels. On being disturbed all pupae exhibit strong activity by sharply flexing the abdomen. They also appear to move position frequently during development which may be related to easy removal of the pupal exoskeleton at ecdysis. The period of post-pupal maturation differs markedly, being longer in *P. reticularis* than in the others. The time a fully developed adult spends in the pupal chamber also varies, depending on the time of the year in which pupation takes place. It reaches a maximum in *Didymocantha* and *Blosyropus*, both of which appear to hibernate.

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News Item

The following is an interesting observation recorded in a letter to the Editor by Mr. Norman Elder, 43 McHardy Street, Havelock North:—

"March 2, 1956, Ruahine Range, Otumore Ridge, at the head of the Tukituki River, at an altitude a little below 5,000ft. Clear weather with a light westerly breeze. White butterflies (*Pieris rapae* Linn) in considerable density, and some thousands in number, were concentrated along the lee side of the ridge on a front of perhaps half a mile, attempting to cross it in the face of the wind, but being blown back. The time was approximately 3–3.30 p.m."

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